Spaces enabling game-changing and sustaining innovations: Why space matters for knowledge creation and innovation

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Spaces enabling game-changing and sustaining innovations

Subtitle:

Why space matters for knowledge creation and innovation

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Abstract

Innovation has become one of the key drivers for growth. However, how do we bring about innovation which is both radical and respects the limits of the world? One of our key assumptions is that we have to take into consideration the epistemological and cognitive processes leading to (radically) new knowledge first. We propose an approach that establishes spaces enabling such processes of knowledge creation—we refer to them as *Enabling Spaces*.

This article is concerned with the question of how innovation, and more specifically, profound, radical, and sustainable innovation can be brought about in a more qualitative manner. What are the necessary concepts and attitudes which facilitate the processes of innovation. The notion of *enabling* as opposed to "managing" or controlling innovation will be developed. Furthermore the concept of *situated/extended cognition* will be discussed as a key ingredient for Enabling Spaces.

The second part gives an overview of the concept of Enabling Spaces and of the design process leading to such spaces. Finally the concrete case of a knowledge creating university will be discussed.

Keywords: cognition, cognitive science, enabling, enabling space, epistemology, innovation, knowledge creation, office design, situated cogition.

1 Introduction

What makes innovation so interesting for individuals, companies, for economies, for society (e.g., social innovation; Thackara 2005), or for science? It is not only since Schumpeter (1947) that innovation exerts quite some fascination to a wide range of people. Besides an increase in productivity, quality, or some other factor which seems—at least for the moment—to be a change for the "better", there is the fascination of *newness* which is essential for almost any form of innovation. Innovation has something to do with coping with *future* events and challenges in an adequate and sustainable manner. Predicting the future has always exerted quite some fascination on humans; to be prepared for the unexpected, to protect oneself from possible future dangers, to make use of the unforeseen, to shape a new and unpredictable world, society, market, etc.

Looking more closely and investigating the causes behind innovations reveals that a more or less complex *knowledge process* can be found to be at the root of every innovation. This process leads to "new" insights being the foundation for a particular innovation, for a new product, service, business model, social innovation, cultural development, scientific model, etc.

The big question is, how do these "new insights" come about? What are the conditions and contexts that facilitate these processes? One of the main objectives of this paper is to develop both a theoretical framework for answering these questions and to show how it can be translated into the realm of practical applications.

In a first step an introduction to the concepts of *innovation* and how it can be *enabled* will be given: we will develop an understanding that innovation and creating new knowledge can*not* be managed or brought about in a mechanical manner. Rather, we have to see that the only action we can take is to *enable* such processes. I.e., we have to create an enabling context that these processes of creating new knowledge and innovation can come about or *emerge*. Hence, we have to take a closer look at the concept of enabling (as opposed to managing or controlling) in the context of knowledge creation and innovation first.

In a second step, it will be shown that these processes are always based on cognitive processes which themselves are embedded or situated in a concrete physical, social, and cultural environment. The *situated* or *extended* approach to *cognition* (e.g., Clark 1999, 2008; Hutchins 1995; Suchman 1987) suggests that cognition goes far beyond the brain and extends to its environment.

As an implication, we combine the concept of enabling with this notion of extended cognition in a third step. What does that mean for the context of our initial question of how to facilitate processes of innovation and knowledge creation? The basic idea consists in constructing and designing environments in such a way that a smooth, stimulating, and fertile interaction between these domains is established: an interaction between these environments and the participating cognitive system(s) in order to facilitate cognitive processes of creating new knowledge. We refer to such environments as *Enabling Spaces*.

In a fourth step, a process will be presented how such Enabling Spaces can be designed and realized. It involves a phase of in-depth research, observation, deep listening, and sense making in order to identify the core knowledge- and innovation-processes of the organization. The resulting core knowledge/innovation-process model offers a highly abstract and condensed knowledge perspective on the organization. It has to be translated into concrete architectural designs, organizational and social interventions, technological concepts, etc. This is achieved via so-called design patterns (Alexander et al. 1977).

Finally, the resulting concepts are consolidated and get realized. We are going to present a concrete project which has been developed by the design process described above.

The key to the whole concept of Enabling Spaces is to understand them as a consistent *integration* of enabling *structures* and knowledge *processes*. These structures comprise architectural, social, cognitive, emotional, etc. aspects which themselves have to be integrated in an interdisciplinary manner.

2 Enabling innovation—theoretical foundations

When we are studying the phenomenon of innovation we do not only have to take into consideration economic, social, or organizational issues. Rather, we have to shift towards an understanding that any kind of innovation activity—at its very core—is based on *epistemological* and *cognitive* processes. They are the foundation for the economic dynamics, for social processes and interactions, for organizational processes and structures. This implies that, if we want to understand, *what* profound, sustainable, and at the same time game-changing innovation is and *how* it can be brought about and facilitated we have to start our investigations on this level of cognitive processes. Furthermore, we have to study how

they are embedded in the environment and, through that interaction, bring forth (radically) new knowledge leading to innovation(s).

Consequently, if we want to understand the notion of Enabling Spaces, we have to tackle at least the following questions on a theoretical level, before we can go into the more practical issues: (a) what is the "*epistemological modus operandi*" for bringing forth (radically) new knowledge? and, closely connected with this question, (b) what are the value systems which are applied in this context. Finally, (c) how are these knowledge processes *embedded and embodied in our cognition* and in our *world*? Before tackling these questions we take a quick look at our notion of innovation.

2.1 Innovation

Before elaborating on Enabling Spaces in detail, we have to take a closer look at the notion of innovation. Innovation processes are reciprocal processes of interaction of different elements and activities (e.g., observing, listening, communicating, researching, creating new knowledge, etc.) carried out with a distinct attitude (e.g. enabling) aiming at specific domains (or key players). The following interacting domains can be identified:

1. *Object of innovation*: in order to come up with sustainable and game-changing innovations it is necessary to have a profound understanding of the core of the object of innovation.
2. *Users/Market*: This domain provides the goal (telos) for any innovation activity: the innovation has to get into resonance with the users and—at the same time—provide something new.
3. *Society*: every innovation is embedded into a given society providing all the cultural constraints, values, etc.
4. *Technology*: technology is one of the main sources and drivers of innovation—they provide the core for almost any innovation in the sense that they provide the "mechanism" which is responsible for the functioning of the system (Arthur, 2007).
5. *Organizations*: Organizations are the "structural container" in which most of (industrial) innovations come about. In most cases organizations provide the *stability* ("retention") that is required in a highly dynamic and volatile innovation dynamics.

These domains must not been as separate from each other, but rather as being in permanent interaction with each other. It has become obvious from the above categorization and modes of interaction involved along the innovation process, that these require specific settings or "enablers" in order to produce the intended results. Thus, as will be shown in the course of this paper, the authors are convinced that innovation- and knowledge processes

are always tied to a specific context as well as to concrete spaces. However, often this fact is neglected both theoretically and—as often encountered in our work—practically.

2.2 Enabling as a core concept for innovation

What are necessary conditions, concepts, as well as attitudes, which facilitate processes of innovation? This section is concerned with the question, of how innovation, and more specifically, profound, radical, and sustainable innovation can be brought about. We are going to present a concept which turns out to be crucial for any kind of innovation process: the notion of *enabling*.

"Managing" innovation is going to fail

Enabling is put in opposition to "managing" innovation processes. Being a "good" manager of a business means to keep things—at least to some degree—under control. As the systems theory or the cybernetic perspective on organizations suggests (e.g. Luhmann and many others) almost every system has a tendency toward remaining in its homeostatic stability, in its well established routines and processes, etc. In a way innovation seems to be an enemy for organizations as it aims at destroying or destabilizing established routines. From that perspective it is clear that classical managers do *not* want to somehow incorporate innovation processes into their daily routines and processes as they are perturbating them only. If innovation should be incorporated at all, it should fit into their routines and processes. In other words, their secret wish is to "*domesticate*" innovation to a process, which is predictable, deterministic, and scalable. In that approach, innovation is reduced to a *mechanistic process* producing new insights, knowledge, and, finally, new products, services, business models, etc.

What attitude and which values can one find standing behind such an approach to innovation? There is clearly an attitude of *making* ("facere") and *controlling*: the assumption is that innovation can be produced or controlled as any other process, such as production processes. It is clear from experience that even less complex production processes can be controlled only to a certain extent: Reality always has unpredictable surprises, which cannot be captured in even highly complex process descriptions and in the knowledge being embodied in even highly "intelligent" production machines. This is caused by an ontological gap between what we refer to as reality/environment and the knowledge about this reality. Reality is always more complex and richer than the knowledge about it. Hence, it is always "one step ahead" and—in spite of all our attempts of cognitive or scientific domestication—will always surprise us with its unpredictable dynamics.

What is true for more standardized processes (such as quality management, production, etc.), which are commonly assumed to be "controllable", applies even more to innovation

processes. Controlling, making, or "managing" innovation by applying rules or recipes turns out to be a *contradiction in itself*. Looking more closely from the perspective of logic reveals that knowledge resulting from a process of applying rules cannot be really new in a more profound sense. (In a formal system) applying rules (which is more or less equivalent to running an algorithm) just makes explicit what is implicitly given in this set of rules. In other words, the rules span a knowledge space and implicitly provide it with a certain structure. This structure cannot be seen directly from these rules—it is necessary to apply these rules in order to make this implicit structure explicit. Consequently, the resulting knowledge is not really new, as the structure of the knowledge space is already implicitly given by the rules. It just gets explored in the process of applying these rules.

Searching for an alternative: enabling

This does not imply that there are no rules allowed at all for structuring and organizing innovation processes, however. As will be shown the difference lies in the *attitude* towards the role of these rules and how these rules are applied. While in the classical perspective the attitude of control and making was in the fore, the authors suggest to replace this position with an attitude of *enabling*.

What does "enabling" mean in the context of generating new knowledge and innovation? The answer covers two aspects which are crucial: (i) On the one hand we have to give up on the regime of control, determinism, and making. (ii) On the other hand enabling implies to *provide a set of constraints* or a *facilitating framework* supporting the *processes of bringing forth new knowledge*. This can be best thought of in a metaphor (inspired by systems theory) of a (force) field: the constraints are realized as attractors and repellers. They are responsible for modulating the knowledge dynamics: it is driven both by its internal dynamics and is carried by the forces of the attractors/repellers. Beyond that, the knowledge dynamics may themselves have an influence on the structure of the framework of constraints (i.e., attractors/repellers). This is a typical structure of a "design problem" (e.g., Dorst, 2003, 2006): as opposed to a well structured problem/solution space (see above) this knowledge creation space itself may be changed during the process of navigating it. This implies a highly dynamic and autonomous knowledge field changing its own basic parameters and premises over time.

2.3 Epistemological implications and attitudes

Why are these concepts of interest for our context of innovation and enabling? If we are interested in radical, yet "organic" and sustainable innovation we have to think about it in terms of something, which is "in potentia" (compare (Aristotle's Metaphysics [2007], De anima [2000] or (Stein, 1986)), something which is *not directly visible or obvious yet*, which is

hidden, but which is already there as a germ, which is here in potentiality. Something that wants to *break forth*, but which is *highly fragile* and which is too weak to break forth by itself in most cases. This is also closely related to what C.O.Scharmer refers to as *self-transcending knowledge* (e.g., Scharmer, 2001, 2007; Senge et al., 2004; Kaiser, Fordinal, 2010). Therefore, it is necessary to facilitate this process of shifting this object/phenomenon from being in a state of "in potentia" into being "in actu". This is what we refer to as *enabling*: facilitating the process of breaking forth of (new) latent qualities & dynamics, facilitating to "give birth" to a new form, new knowledge, etc.

Comparing this process to traditional approaches of innovation and knowledge creation, it is clear that this goes far beyond classical "out-of-the-box thinking" or creative tools (e.g., Kelley, 2004; DTI, 2005). Peschl and Fundneider have developed a whole innovation paradigm and a systematic innovation process around this approach called *Emergent Innovation* (Peschl, Fundneider, 2008a, 2008b; Peschl et al., 2010).

Enabling as attitude

What are the implications of this approach of enabling for innovation and knowledge creation? First of all, it has to be clear that this is not only an abstract and cognitive concept, but that enabling is mainly a question of *attitude*, it is a *habitus* or a paradigm of thinking and acting. Unfortunately, the enabling paradigm is a rather "*poor*" and *weak* concept in the following sense: one has to give up control and let things go and let things develop. "Reality does a large part of the job for you." Of course, this is not a very comfortable position—especially in a business environment where everything has to be determined, calculable, "managed", and predictable. However, the enabling attitude is a consequence of having to admit that we are not in (total) control especially when being engaged in innovation activities. It seems to be more sensible to "surrender" than to invest too much energy and resources into an epistemological battle, which we will never be able to win. However, enabling does not imply that we are only passively sitting there waiting for an innovation to break froth; quite the contrary is true: the real challenge is to create enabling structures in the form of constraints, which support these highly fragile processes. In this sense managerial and enabling attitudes do not really contradict each other.

As a consequence the enabling approach requires an alternative set of attitudes, values, habitus/habits, as well as epistemic practices: first of all we have to (re-)acquire "epistemological virtues" of openness, being able to reflect, to radically question ourselves, and to let go. Furthermore, we have to (re-)learn to listen and observe closely; to let im-press ourselves[1], meaning that we are open to something that is changing us (even if it means that

[1] Impress in the sense of, for instance, a seal which is impressed on a piece of wax and leaves its mark/structure in this piece of wax.

we have to give up on well established and dear patterns of thinking). We have to cultivate our patience, our ability to wait for the "right moment" (kairos | καιρός), to listen to weak and fragile signals and cultivate/incubate them, to let come, to follow the flow of reality. Finally, we have to learn how to provide an ecosystem or "living ambiences" of cultivation, facilitation, incubation, and enabling, rather than a regime of control and forced change.

In conclusion enabling requires a high level of humbleness giving reality priority (for a process of innovation "from within") over one's own projections and ideas. It can be clearly seen that this is not just a "skill", but it is intrinsically tied to an existential attitude.

2.4 Extended situated cognition and knowledge creation in Enabling Spaces

What does these processes of enabling innovation drive? It is clear that we do not only have to take into consideration the epistemological processes, but also the *cognitive processes* which are responsible for bringing forth this new knowledge. Looking more closely reveals however, that it is not sufficient to consider cognitive processes by themselves, but that we have to rethink the whole process of cognition in its extension and in its systemic environment.

While classical approaches in cognitive science (e.g., Friedenberg, Silverman, 2006; Stillings et al., 1987; Varela et al., 1991, and many others) focus on the cognitive processes *inside* the brain, the *situated cognition* approach takes not only into account the *embedding* of the cognitive system into its *environment* (e.g., Clark, 1999, 2001, 2008; Hutchins, 1995; Suchman, 1987; Thelen, Smith, 1994; Peschl, 1997), but takes it very seriously. Clark shows that "…in building our physical and social worlds, we build (or rather, we massively reconfigure) our minds and our capacities of thought and reason." (Clark, 2008: p. xxviii) Hence environmental structures become part of the cognitive process and, thus, of knowledge creation processes.

In a way one could say "the world thinks for and with us". That is the point where the concept of *Enabling Spaces* comes in: innovation is not only a cognitive activity taking place inside the brain, but it is intrinsically coupled with the environment. Innovation is heavily dependent on the interaction and immersion with the environment, be it in the process of close observation, of interaction with other persons of the innovation team, or in the process of fast-cycle learning through prototyping, which is a kind of "thinking-with-the-object"-process. Such a perspective is, of course, particularly interesting when our focus is on knowledge- and innovation-work: these processes realize themselves in a permanent interaction between the environment and cognitive processes of an individual or a group of cognitive

systems. Hence, here we are confronted with the question of how *environmental structures* can act as *enablers* for processes of profound innovation. The situated and embodied cognition approach in cognitive science which Clark (2008) refers to as “extended cognition” gives some hints as to what should be considered in such a design of situated innovation processes.

What are the implications for our initial question of designing spaces facilitating processes of knowledge creation? After having laid the theoretical foundation both on an epistemological and a cognitive level we are going to take the next step and take a closer look, how the presented concepts of enabling and extended/situated cognition can be combined and applied in the context of bringing forth (radically) new knowledge and innovations.

3 Enabling Spaces enabling sustainable innovation

3.1 Enabling Spaces: background

In this section the concept of *Enabling Spaces* will be presented (cf. Peschl, 2007; Peschl, Wiltschnig, 2008; Wiltschnig, Peschl, 2008; Peschl, Fundneider, 2010). It is based on the theoretical insights having their roots in the epistemological considerations concerning the approach of enabling as well as in the situated/extended cognition approach from cognitive science (e.g., Clark, 2001, 2008). The following research questions are leading our considerations:

- How do we have to design environments and eco-systems which support processes of innovation and knowledge creation?
- What role does an “attitude of enabling“ play in such spaces?
- How can the approach of enabling be realized in a concrete space?

Hence, an *Enabling Space is a space supporting, enabling, and facilitating processes of innovation and knowledge creation*. According to the insights from the extended/situated cognition approach the concept of Enabling Spaces takes the following issue very seriously: their structures reflect the need for specific environments/contexts for different types of cognitive processes and knowledge work taking place in the course of innovation processes.

Conceptual roots of Enabling Spaces

The concept of Enabling Spaces has many roots, which can be traced back to ancient times: whenever spaces where needed where some kind of knowledge work (be it intellectual, educational, philosophical, religious, practical, artisanal, etc.) took place, people were considering the specific design of such a space (e.g., a liturgical space, a space for philosophizing, educational settings, workshops, ateliers, etc.). In the philosophical context

(Nishida, 1999) work on the logic of place had a strong influence on understanding the role of place and space on processes of thinking. Nonaka et al. (1998, 2003, 2008) developed the concept of "ba" (partly) on the basis of Nishida's work:

> „Ba is a continuously created generative mechanism that explains the potentialities and tendencies that either hinder or stimulate knowledge creative activities… The knowledge-creating process is necessarily context-specific in terms of time, space, and relationship with others. Knowledge cannot be created in vacuum, and needs a place where information is given meaning through interpretation to become knowledge… We define ba as a shared context in motion, in which knowledge is shared, created, and utilized… Ba is a phenomenological time and space where knowledge, as ´a stream of meaning´ emerges. New knowledge is created out of existing knowledge through the change of meanings and contexts… Ba is an existential place where participants share their contexts and create new meanings through interactions. Participants of ba bring in their own contexts, and through interactions with others and the environment, the contexts of ba, participants, and the environment change… Ba is a way of organizing that is based on the meaning it creates, rather than a from of organization such as hierarchy or network" (Nonaka, Toyama, 2003: p. 6f)

Krogh et al. (2000) have utilized this concept in the context of knowledge creation while others (e.g., Moultrie et al., 2007; Lewis, Moultrie, 2005; Kristensen, 2004) have come up with theoretical as well as practical results in the field of theory and technology of creativity. There are several examples in the field of architecture (e.g., Allen, Henn, 2007) and designing educational settings (Oblinger, 2006; Peschl, 2006a, 2006b).

Enabling Spaces: a framework of enabling constraints

Enabling Spaces are multi-dimensional spaces (architectural space, social space, emotional space, epistemological space, etc.) that are orchestrated in an integrated manner in order to best possible support innovation activities with a focus on game-changing or radical innovations (as opposed to incremental innovations). In our approach we are following a rather broad understanding of space: space is understood as a *container* providing a set of *constraints* which is responsible for holding this container together as well as giving it a minimal structure and dynamics. It is a space providing enabling structures as well as constraints allowing knowledge processes to flow and to develop their own dynamics in such a way that radically new knowledge may break forth (see above).

It is necessary to consider constraints from many different disciplines, such as social, emotional, cognitive, cultural, technological, epistemological, organizational, and, of course architectural constraints. The challenge is to integrate these aspects into an holistic

ensemble which functions as an Enabling Space. It is the *interdisciplinary* interaction between these elements that brings about a seamless flow of knowledge and interaction between the participating cognitive systems and their environment.

Integrating (knowledge and innovation) processes and structures/constraints

As opposed to many other approaches the USP of Enabling Spaces is to *integrate* (knowledge/innovation) *processes* and *structures*/constraints in a highly consistent manner. This can only be achieved, if one takes a radical epistemological perspective: namely, one starts with studying the knowledge- and innovation processes, which are involved in the prospective Enabling Space. Beyond that it is necessary to dive into the culture and the internal structures of the organization in order to gain a profound understanding of its *core*. This core is the foundation for developing core processes and—on their basis—*design patterns* (Alexander et al., 1977) which are the first step toward an integration of processes and structures.

The framework of Enabling Spaces acts as a container holding innovation processes and activities. The Enabling Space is designed as a multi-dimensional space, in which architectural/physical, social, cognitive, technological, epistemological, cultural, intellectual, emotional and other factors are considered and integrated, aiming to support innovation activities. In the following sections, these dimensions will be described.

3.2 Architectural Space

This is the physical space, or the Euclidean space in which the innovation- and knowledge processes are taking place. It is an intentionally designed and built physical environment that surrounds the users with its concrete physical structure(s). These structures comprise all elements in the space and its context, be it walls, furniture, windows, etc. This space is mainly characterized by two elements: architecture (as built structures) and design. These two elements are highly inter-related and cannot be treated (or defined) as separate entities. Examples of what the authors see as architectural spaces are: offices, spaces for creative and knowledge work, houses, urban places, or urban settlements, etc.

The challenge is to design this space in such a way that the flow of knowledge and social interaction is supported in the best possible way for the specific task at stake. In most cases today's architecture leads to "disabling spaces" rather than enabling or even actively supporting knowledge and innovation processes. Allen and Henn (2007), Krogh et al. (2000), and many others give good examples of how to solve this architectural design challenge.

3.3 Social space

Besides epistemological processes, social interaction is crucial for any kind of innovation process. Knowledge processes are always embedded in social processes; social interaction is a *conditio sine qua non* for the emergence of (radically) new knowledge in a collaborative setting. As is shown in Kelley (2004) and by many others social groups are essential for bringing forth innovation and new knowledge—it seems that the time for individual mavericks is over in the context of innovation.

From an epistemological perspective we know that the knowledge processes, which are involved in the course of radical/game-changing innovation are *highly fragile*—the new is unknown, it cannot be planned, there is lot of intuitive knowledge involved, in many cases one expresses very personal and existential thoughts and intuitions during such a process. Therefore, there has to be a "social container", a (social) atmosphere, in which these processes can develop their own dynamics, can gain their own strength.

It is clear that *trust* plays an essential role in such setting. The process of bringing forth radical innovations will only be successful—from idea generation to implementation—if an atmosphere of trust, dialogue, and openness is present. Apart from other aspects, trust and openness are key social enablers, which have to be established before any kind of innovation work can start. That is why it is necessary to spend much energy in selecting the "right" members of an "innovation team" and to find a socially as well as functionally well balanced constellation.

3.4 Cognitive space

Besides the social dimension any innovation has its origin in the individual brain and in cognitive processes. Cognition (and its interaction with the environment; cf. Clark's (2008) extended cognition approach) is the source of new knowledge. Hence, it is the cognitive space which has to be taken into account when thinking about Enabling Spaces. There is a closed "enabling feedback loop": the surrounding spaces act as enablers for these processes and these cognitive processes are the enablers for bringing forth new knowledge.

What are the key cognitive enablers among the cognitive activities which are provided by our brain? (Emergent) Innovation (Peschl, Fundneider, 2008b) heavily depends on the capability to *observe* closely, to "*listen* to what wants to emerge" (Scharmer, 2007), to *reflect* one's premises, to sense and to understand one's own patterns of thinking and perception (2nd order observation; e.g., Glanville 2007), to enter into a "real" *dialogue* (Bohm, 1996; Isaacs, 1999), practical intelligence/phronesis (φρόνησις) (e.g., Nonaka et al., 2008), learning processes in a prototyping setting, etc.

3.5 Emotional space

Cognition is always embedded into *emotional states* (e.g., Gazzaniga, 2000; James, 1884; LeDoux, 2000; Damasio, 1994, 1995; Bechara et al., 2000, and many others). Think of the situation when uttering a very vague intuition about some new thought in front of a group (comprising perhaps someone who is above me in the organizational hierarchy); this requires some boldness, which always involves the emotion of fear. Here one can clearly see the close interaction of the cognitive, the social, and the emotional dimension of Enabling Spaces and the necessity to integrate these aspects into a holistic and well-designed enabling eco-system.

However, the emotional dimension of Enabling Spaces is not only about "feeling well". In some cases it is necessary to push oneself into an emotionally *uncomfortable* situation in order to leave behind one's cognitive housing (Stephan, 2006) and well-established and dear patterns of thought and perception.

3.6 Epistemological space

Besides behavioral action cognitive processes bring forth *knowledge*: both internal and external knowledge (i.e., in the form of artifacts). Dealing with innovation processes always involves a wide spectrum of different types, categories, styles, or genres of knowledge processes: there is a huge difference between the knowledge being involved and created in a process of ideation, of close observation, of intuitive reasoning, of deep understanding, of sense making, of prototyping, of letting-come, of reflecting, of implementing, of executing a routine, etc.

Hence, in order to establish an epistemologically enabling eco-system, one has to first identify the knowledge processes, which are relevant for the particular innovation process. One has to understand the very nature of these processes. Finally, it is necessary to create an enabling environment (in the sense of boundary conditions, constraints, attractors, etc.) in which this knowledge dynamics can develop, can grow and flow. From these considerations it becomes clear that the resulting spaces will look very differently according to the supported knowledge process and organizational culture and social setting.

3.7 Cultural and organizational space

Innovation is always embedded into the culture and organizational structures of an organization. They heavily influence the enabling or disabling effects on innovation- and knowledge creation processes. Organizational issues comprise the hierarchy, the departmental structures, the interaction patterns, the communication culture, the "corporate openness" (or hermeticism), etc.

Innovation almost always requires some kind of organizational change,—as is shown by the systems theoretic approach—since there is an intrinsic resistance against innovation and new knowledge in most organizations. Experience shows that establishing an Enabling Space often implies a more or less radical change in the organizational structure and or culture.

3.8 Technological space

Innovation processes are always embedded in a technological environment. This comprises a wide range of technological means ranging from “low-tech” tools, such as white boards, flip charts, light ambiences, etc. to high-tech tools such as computers, the internet, social media, visualization tools, complex software, knowledge displays, etc.

In most innovation processes, technological support from the area of *design (thinking)* has turned out to be highly productive (e.g., Brown, 2008, 2009; Sanders, Stappers, 2008; Laurel, 2003). These tools comprise mapping technologies, knowledge technologies, observation technologies, or simulation and prototyping technologies.

3.9 Virtual space

Innovation and knowledge creation does not necessarily have to take place always in a face-to-face setting. Much of the work can be done in the virtual realm. Hence, virtual tools enabling these processes may support the process of observation, collecting and ordering data and knowledge (e.g., electronic journal and work spaces), documenting, prototyping, simulating, collaborative knowledge creation, etc.

3.10 Integrating enabling dimensions

It is clear that these dimensions cannot be seen separately—rather, the very goal of Enabling Spaces consists in *integrating* these aspects in a *radically interdisciplinary* manner into an integrated design, into a whole, like a composition, a piece of art (“Gesamtkunstwerk” in German).

Take the example of the process of knowledge creation. Here we see the necessity of integrating social, cultural, emotional, physical/architectural, as well as epistemological issues: bringing forth new knowledge is a highly fragile knowledge process, which is about intuition, listening to weak signals, deep thinking and understanding, incubating vague knowledge, etc. Due to the fragility and vulnerability of these processes it is necessary to create a kind of *container*, an Enabling Space, providing *qualities* like offering an environment of *protection*, of being able to hold and cultivate epistemological and social

fragility, of enabling the free flow of knowledge, of silence, of “no-error” (in the sense that in such a phase there is no “right” or “wrong”), openness, etc.

These design qualities have to be translated into integrated and interdisciplinary concepts, which—in their wholeness—form the concrete Enabling Space. In our example this means that *trust* is a major issue: trust not only between the team members (i.e., in the concrete social domain), but also as a cultural value in the organization, which does not only exist on paper, but is practiced in every routine and social interaction. This implies that, for instance, *hierarchies*—although necessary—will not play such an important role in the interaction between the members of an organization. Furthermore, there has to be established an (epistemological) understanding that the knowledge and processes which the team is dealing with here are highly fragile and need completely different mindsets and attitudes: a different mode of operating, of talking and interacting with each other, novel criteria of evaluating and judging, etc. The (interior) design of this space has to reflect this vulnerability and fragility on the one and the openness on the other hand. This dichotomy can be solved, for instance, by a semi-transparent “interface” (e.g., semitranslucent glass walls, etc.) towards the inside of the organization and with big windows to the outside. The interior design of this space has to be characterized by a relaxed atmosphere and non-hierarchical layout enabling the free flow of knowledge.

Such a space of protection is closely related to what happens in an experiment or in a lab situation in science: a space where unknown things can be explored in a rather protected and free manner. It is not a completely free space, however: there exist minimal rules and boundary conditions (e.g., of scientific conduct), but within this space one is free to explore even the most remote ideas. Another example is a well designed educational setting or a setting for letting little children develop and play: it is about offering an environment finding a good balance between protection, trust, openness, and minimal rules and constraints.

Apart from these elements one has to consider the corporate/organizational *culture* as a key constraint. Enabling Spaces receive their “flavor” by the organization’s culture and might differ considerably according to these constraints. One can see clearly that the creation of Enabling Spaces is a real *design challenge*; it has to be done for each organization *individually* and there do not exist standard solutions and simple rules which one just has to follow in order to come up with a ready-made and fully functioning Enabling Space fitting organically into the organization. Hence, it is necessary to develop a *design process* translating these rather abstract innovation-, knowledge-, and core processes of an organization along with its culture into design qualities/patterns and, in a next step, into concrete elements integrating above dimensions into an Enabling Space.

As a consequent next step, the authors stretched the framework of Enabling Spaces to organizational and even urban settings. This required a more robust approach and design process, which the authors explored and developed over several years.

4 Realizing Enabling Spaces—a case study

In this section, we will show how the theoretical considerations about Enabling Spaces can be put into practice by presenting a real-world case that has been developed in the context of an architectural competition. As stated in the previous section, the integration and orchestration of different spaces/dimensions—being based on the core processes of an organization—is one of the most challenging problems, yet powerful features of the Enabling Space approach. Hence, it was necessary to develop and test a *stable design process* leading to a high quality interdisciplinary realization of an Enabling Space. The staring point is always the identification of the core knowledge and innovation processes of an organization which are embedded in the organizational environment and its systems and systemic environment.

The case-giver is a private, elite university that announced an architecture competition for planning and constructing a new campus for about 600-800 students. It claims for itself to "bridge Business, Culture and Politics in order to address the growing demand for decision-makers, educated in a multi-disciplinary manner, in the fields of business, culture, media, and public policy". Excellence in research is as important for this university as educating entrepreneurs and leaders that are better prepared for coping with a highly volatile environment and an uncertain future.

4.1 Design process for Enabling Spaces

The design process follows a series of phases which will be described in the following sections:

Going out in the field & deep observation

The first phase of the design process is referred to as "*Observation*". In this phase, about 15 qualitative interviews (generative/appreciative interviews; e.g., Cooperrider et al., 2000; Scharmer, 2007) with all relevant stakeholders (students, professors/lecturers, people form the rectorate, administration, as well citizens, etc.) were conducted. An interview lasted for about 2 hours and aimed at establishing deeper insights into the organization in order to develop a profound understanding of the core processes of the university.

These interviews are valuable as they not only generate a lot of information and knowledge about what makes this university unique, but also represent seeds of new solutions. For

instance, in one interview with the head of the library, a concept was born that placed the library as the “heart” in the new campus.

In another context, interviews with several students revealed that spaces for specific purposes are missing at the university. At the existing building, the provided rooms offered a good quality (light, aesthetics, technological support), but lacked the support of specific activities that are of great importance for students: working together in teams for projects and occupying rooms over a longer period of time, working in an artistic setting, concentrated learning in small groups, etc.

Besides the interviews, the authors visited the site several times and conducted ethnographical studies observing and investigating the context, urban setting, cultural issues, etc. (e.g., Spradley, 1979, 1980; Kawulich, 2005; Laurel, 2003).

Sense making & deep understanding

The next phase of the design process consisted in “Sense-making”: it is necessary to handle and order vast amounts of information from the field. The aim of this step is to *identify patters* within this information in order to come up with the most important processes or activities (“core processes”) that define the university. This is a highly challenging inductive process and it is necessary to work on big tables and literally/physically move items around, (re-)group, and relate them. The result is a highly condensed model of the core processes being depicted in Figure 1.

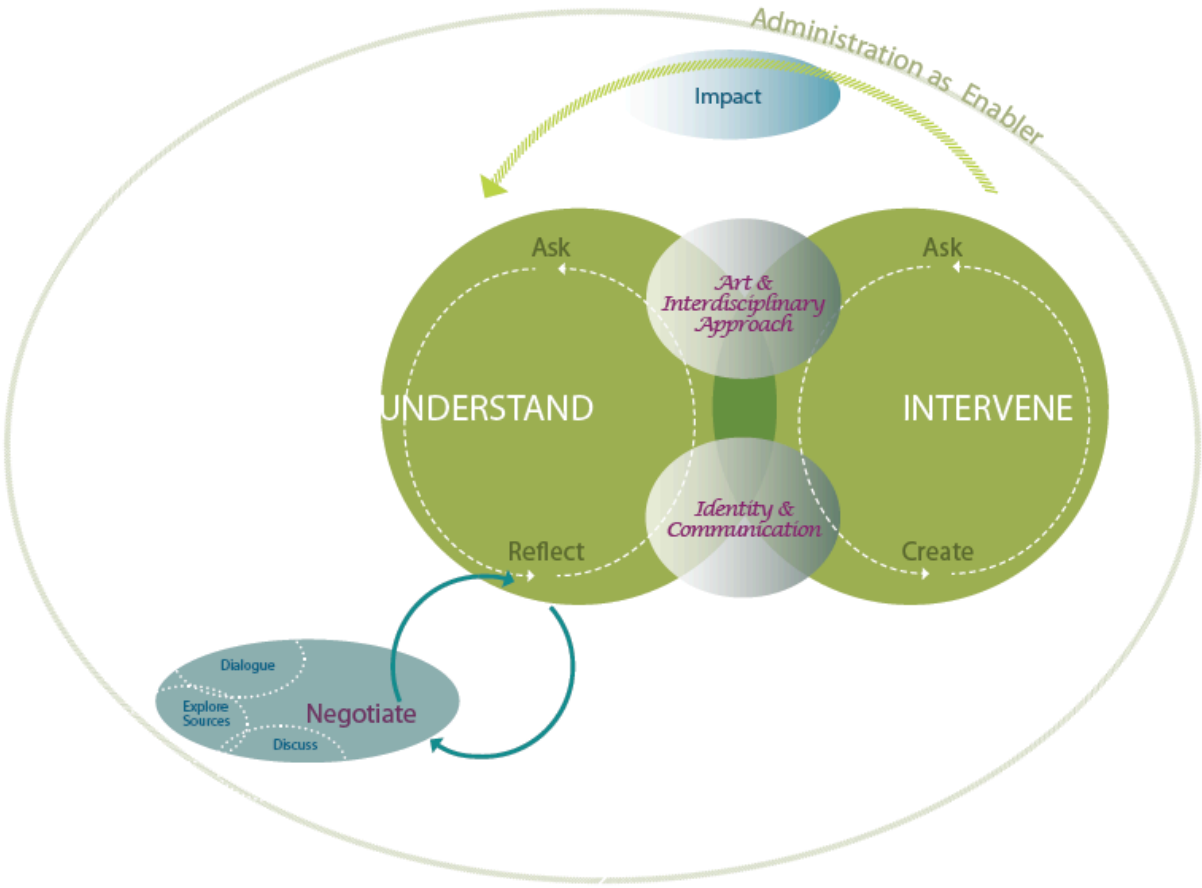

Figure 1: Structure and interaction of the core knowledge and innovation processes.

The university is in a constant interplay between understanding and intervening. Both processes must not be seen as two poles, but rather as integrative elements of one cognitive activity (both on an individual and collective level): understanding and intervening cannot be understood or done separately. Whereas the process of “understanding” deals primarily with an intellectual penetration of an object or phenomenon, “intervening” is about acting, doing and the transformation of the object. The two core processes “understand” and “intervene” are embedded or penetrated by two streams that cut across the entire university: interdisciplinarity and communication.

Design patterns

A detailed description of each core process is the start of the next phase of the process: “Design Patterns”. This is done by means of sophisticated and interconnected mind maps, since these allow a quick grasp of the relevant issues. These maps have the format of *design patterns* (Alexander et al., 1977). These design patterns serve as a kind of *language for bridging the (cognitive/language) gap between the relatively abstract research results* (e.g., core processes) and the involved partners (e.g., architects, designers, etc.) that *translate the*

concepts into concrete architecture. Developing this “translating language” was a key for the interdisciplinary collaboration with the architects. Furthermore, scenarios, illustrations, as well as story-telling tools are used to support the communication of the concepts.

Interdisciplinary design

The final phase that will be presented (the authors´ model has three more steps that are relevant for construction) is referred to as “Interdisciplinary design”. The results of this phase are concrete plans and views. This step requires intense communication and adjustments with architects, landscape planners, designers, etc. depending on the project. It is realized in a series of several workshops in an *atelier*-like setting.

4.2 Case Study—realizations

In the following sections, two aspects of the realized concept will be highlighted in more detail: the library and the lecture/seminar rooms.

The “knowledge soul” of the university

One of the results of our interviews was the idea of a *library* being the “knowledge heart/soul” of a university. Thus, the concept of a library that penetrates the entire university building has been developed. Different knowledge processes (in relation with the library, however in a broader sense) are spread out on several floors of the building. Here are some examples for knowledge processes and their realization in architectural and social structures: concentrated working on a table among other students and with an outside view or concentrated working “in a box” (in absolute silence), working with “distraction” (e.g., sitting in an semi-public area, such as on stairs in the foyer), working in groups of more than six persons (in a enclosed room with necessary equipment and material), a lounge/café (transition zone between cafeteria and foyer, invitation to linger with a book, magazines and newspaper at hand, classical café situation, communicative, etc.), relaxing areas of withdrawal und resting (comfortable sitting furniture; chill-out atmosphere), etc.

Seminar rooms enabling knowledge creation

Instead of realizing about 20 standardized seminar rooms (as required in the official call) the qualitative interviews and observations resulted in another understanding of lecture rooms both from the perspective of students and academic staff: smaller rooms which are not standardized, and which reflect the (knowledge) processes being actually performed in these spaces. Consequently, the authors developed several categories of lecture rooms. A selection which will be described in detail below. The circles in the figures illustrate the knowledge processes that are prevalent for each category (the bigger the circle the higher the importance for this structure).

Co-working space

Besides the classical conference room with rows-, U-, or circular seating (clear, bright, easily convertible seating, white-boards on possibly most walls), it was clear that a space for cooperation between students was a major requirement. The co-working space is designed as an area of *interdisciplinarity*: different scientific disciplines, different roles (students, scientists, artists in residence, [external] entrepreneurs, visitors, etc.), different interests, etc. come together and collaborate on joint projects; it is directed towards the outside world, and an invitation for external stakeholders for active participation. The results are displayed in an open working place.

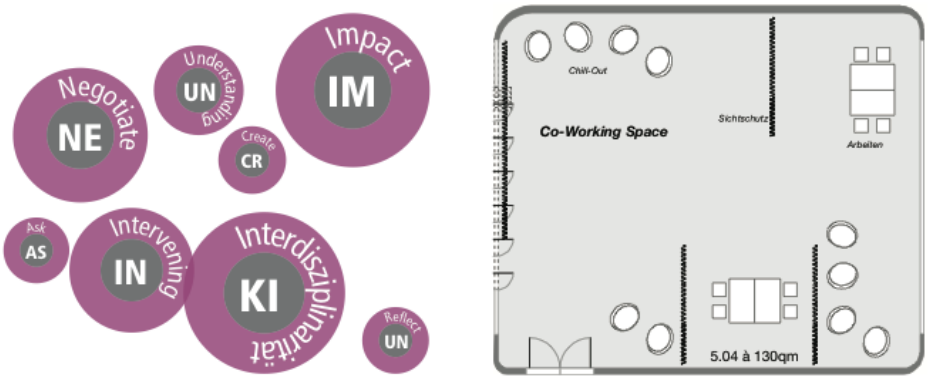

Figure 2: Co-working space. This illustration is the result of a co-creation process between T.Fundneider, M.F.Peschl, and Camenzind Evolution Architects (Zurich, CH).

Project space

Projects are a key element of the pedagogical concept of our university. Looking at most universities reveals that they do not provide any space for project work although students are asked to work together on projects for their classes. Hence, it was necessary to design retreat and working areas for students who need a space for realizing their projects for a defined period of time. Material can be stored there; (interim) results can be mounted on walls; rather closed-shop atmosphere (for a defined group of students); lockers for storing things.

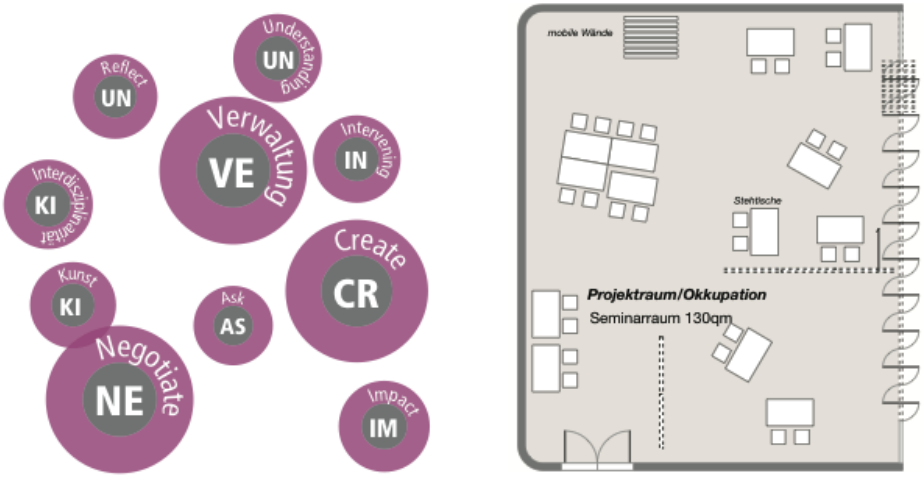

Figure 3: Project space. This illustration is the result of a co-creation process between T.Fundneider, M.F.Peschl, and Camenzind Evolution Architects (Zurich, CH).

It is important to keep in mind that it is not only the architecture which supports these processes, but also the whole culture and attitude at the university. It is the result of an active (social) shaping process.

5 Conclusions

Innovation is a highly sophisticated knowledge and cognitive process. One of the key insights of an "enabling (space) approach to innovation" was that we have to start almost any innovation process which is supposed to bring forth radically new and sustainable innovation with a process of profoundly observing, investigating, and deeply understanding the object of innovation and its systemic context. This is the point of departure for a process of knowledge creation embracing the attitude of enabling: abandoning the regime of control means that we have to give reality more space, more possibilities, and more time to come from a state of "*potentia*" into a state of "*actus*". In other words, that the we give some space that new knowledge may break forth and materialize.

However, this does not happen just by passively sitting there and waiting. An enabling attitude implies that one has to construct a container providing enabling constraints or boundary conditions which facilitate this process of breaking forth of newness. Such a container was referred to as an *Enabling Space*—holding, incubating, and cultivating these fragile processes of knowledge creation. It has been shown that Enabling Spaces comprise several dimensions, which have to be integrated into an interdisciplinary design. The main point is the *radical integration* of (knowledge/innovation) *processes* with (architectural, social,

cognitive, emotional, etc.) *structures*. It is this delicate balance between controlling the processes of knowledge creation and letting them follow their own flow, which represents the quality of an Enabling Space.

Future research is directed towards an even more profound understanding of the concept of enabling in a transdisciplinary context (e.g., from educational sciences, systems theory, etc.). This will allow for a more stable and robust design process. Furthermore, it is planned to apply this approach to related fields, such as creative settlements, creative cities, innovation clusters, etc.

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7 Authors' Short Bios

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Markus F. Peschl is professor for cognitive science and philosophy of science at the University of Vienna. In his research he focuses on the transdisciplinary fields of innovation, cognition, and on designing spaces for knowledge creation ("Enabling Spaces"). He has published more than 120 papers and 6 books. For further information see http://www.univie.ac.at/knowledge/peschl/

7.2 Thomas Fundneider

Thomas Fundneider is founder of the innovation agencies tf consulting (www.tfc.at) and theLivingCore (www.thelivingcore.com), specializing in the areas of innovation and work environments. Having his background in landscape planning, his focus since many years is on game-changing innovations, enabling spaces, entrepreneurship and design (thinking). He teaches at several universities (Johannes Kepler University in Linz, University of the Arts in Berlin, and at FH Hagenberg).